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## **Listening for Whales and Fish in the Northwest Atlantic Ocean**

*Various platforms and technologies offer vision for future network along U.S. East Coast*

Scientists are using a variety of buoys and autonomous underwater vehicles to record and archive sounds from marine mammals and fish species in the western North Atlantic through a new listening network known as the U.S. Northeast Passive Acoustic Sensing Network (NEPAN).

Stretching from the northern Gulf of Maine to the New York Bight in the northwest Atlantic Ocean, NEPAN provides year-round, long-term information on the presence and physical distribution of vocal whales, dolphins and porpoises and some fish species. The archived and near-real-time data comes from recorders on various platforms ranging from fixed bottom mounted and surface buoys to mobile underwater vehicles and surface wave gliders. The data will be used to reduce threats from human activities and address conservation and managements needs central to the mission of the National Oceanic and Atmospheric Administration (NOAA) and other federal agencies. Data will also fill in gaps in scientific information about many marine mammal and fish species.

“NEPAN is an example of how collaborative scientific efforts and financial investment across many federal agencies can produce a novel and wide-ranging solution to gaps in current scientific information,” said Sofie Van Parijs, head of the passive acoustics group at NOAA’s Northeast Fisheries Science Center (NEFSC) laboratory in Woods Hole, Mass.

Researchers hope NEPAN will be the first link in an extensive listening network that would extend along the entire U.S. East Coast, and eventually to waters around the U.S., to monitor marine mammals, fish and ocean noise over time periods ranging from days and weeks to months and years. The vision for the network, and details on the technologies, applications and projects being conducted and planned between 2014 and 2017, are described in an article in the March/April 2015 issue of the Marine Technology Society Journal. The special issue of MTS Journal focuses on “Discovering NOAA: Applications of Science and Technology Then, Now, and in the Future.”

The NEFSC passive acoustics research program, together with support from Woods Hole Oceanographic Institution (WHOI) and a number of federal agencies, are creating the technological infrastructure for NEPAN to address long-term monitoring and mitigation needs for endangered marine mammals and fish. Six of eight whale populations in the western North Atlantic are endangered or of special concern under existing U.S. and Canadian law.

Their vision would include both fixed and mobile assets that would be deployed in sensitive or industrial areas, such as wind farm construction sites, shipping lanes, heavily fished areas or marine reserves. Other assets would cover broad spatial scales to address questions about species' range, migration routes, or presence in unexpected locations. Others would be co-located with oceanographic observatories, such as the Northeast Regional Association of Coastal and Ocean Observing Systems (NERACOOS) buoys and the U.S. Integrated Observing System Pioneer array, to enable research on the influence of environmental variability on the occurrence of marine mammals and fish.

Near-real-time reporting of acoustic detections should improve the efficiency of visual surveys from research vessels and aircraft and on the water research efforts by providing notice of a species presence. Archival passive acoustic recorders would aid monitoring needs that do not require an immediate response to a detection, such as defining migration corridors. The data would be used to inform NOAA Fisheries stock assessment reports, permit consultations, and specific management actions.

Several NEPAN projects are already underway, one on Atlantic cod conservation and the other on ambient ocean noise in Stellwagen Bank National Marine Sanctuary off the coast of Massachusetts. A moored acoustic buoy, deployed in March 2014, is providing real time information in Rhode Island Sound monitoring the presence of baleen whales, and gliders have been used to detect cod spawning. In 2015, a variety of platforms and technologies will be put into operation. They include a wave glider to survey areas of the New York Bight, and a moored buoy that will be installed near Mount Desert Rock, Maine, where fin and humpback whales are common.

"Passive acoustic data collection can be integrated among agencies, regions, and platforms to meet monitoring and management needs within NOAA," said Van Parijs, lead author of the article describing NEPAN. "We are also looking at integrating the NEPAN data into other passive acoustic monitoring efforts being conducted in both U.S. and Canadian waters."

One example is the Western Atlantic Passive Acoustics analysis of mysticetes, or baleen whales, (WAPAW). The project, headed by NEFSC, will utilize existing archival acoustic data from recorders previously deployed along the western North Atlantic continental shelf area. In another project, NOAA's NEFSC and Southeast Fisheries Science Center will collaborate with Duke University and Scripps Institution of Oceanography to monitor 10 sites along the western Atlantic shelf break to understand the occurrence of marine species prior to the start of oil and gas exploration in the western North Atlantic Ocean.

Funding for NEPAN has been provided through competitive research grants and various programs within the U.S. Department of Defense and Department of Energy, Bureau of Ocean

Energy Management (BOEM), Department of Defense's Environmental Security Technology Certification Program (ESTCP), the U.S. Navy's Living Marine Resources Program (LMR) and the Naval Operations Energy and Environmental Readiness Division (N45), with some funding provided by the NOAA Ocean Acoustics Program, and the NOAA Office of Protected Resources.

"Expanding the range of NEPAN throughout the western North Atlantic Ocean will enable researchers to detect more species and address a wider variety of management and conservation applications," Van Parijs said. "The reality is that the continued operation and expansion of a listening network like NEPAN will only be possible in the long-term with clear and direct support from NOAA."

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Related links:

Passive Acoustic Research at NEFSC: <http://www.nefsc.noaa.gov/psb/acoustics/>

Northeast Acoustic Network (NEPAN):  
<http://www.nefsc.noaa.gov/psb/acoustics/psbAcousticsNEPAN.html>

Acoustic Behavior of Fish:  
<http://www.nefsc.noaa.gov/psb/acoustics/psbAcousticBehaviorFish1.html>

Autonomous Real-time Marine Mammal Detections: <http://dcs.whoi.edu/>

NOAA Fisheries Ocean Acoustics Program: <https://www.st.nmfs.noaa.gov/marine-mammals-turtles/acoustics/index>

Listening for Cod in the Gulf of Maine:  
[http://www.fisheries.noaa.gov/podcasts/2015/03/listening\\_for\\_cod.html](http://www.fisheries.noaa.gov/podcasts/2015/03/listening_for_cod.html)